

Aeronautical Information Exchange Model (AIXM)

AIXM 5 Profile of ISO 19107 Spatial Schema

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1 Scope

1.1 Introduction

This document presents the AIXM 5 Profile of ISO 19107. The purpose of the profile is to identify the parts of ISO 19107 that will be adopted and extended by AIXM. The document is based on the GML 3.2 Profile of ISO 19107 found in Annex D to [2].

1.2 Background

Geometry is an integral part of aeronautical feature definitions. In the aeronautical domain, feature geometries may be 2 or 3 dimensions. Some examples include (see Figure 1):

- Navigation aid represented as a point with an elevation
- Runway element represented as a line segment
- FIR (Flight Information Region) airspace represented as a prism (vertically extruded horizontal polygon)

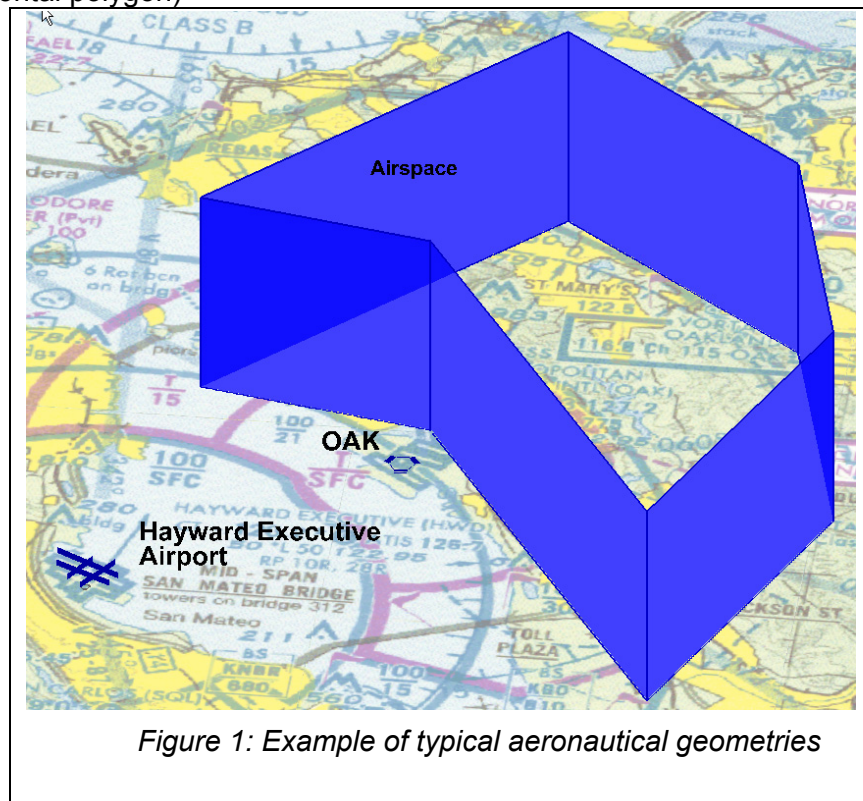


Figure 1: Example of typical aeronautical geometries

AIXM 5 uses a 2 ½ D geometry model based on the ISO 19107 Spatial Schema. In the 2 ½ D model, horizontal geometries are represented using the ISO 19107 Spatial Schema and vertical geometric components are represented as properties of the feature.

1.2.1 Introduction to profiling ISO 19107

ISO19107 spatial schema standard describes spatial objects with characteristics like size, shape and topology [1]. Using ISO19107 as the basis for geometric representation in AIXM has several advantages:

- Standardized geometric representation
- ISO19107 is the basis for Geometry Markup Language (GML), an XML grammar for spatial features.
- Increases the potential for AICM/AIXM implementers to leverage COTS GIS tools.

The ISO 19107 spatial schema is very complex. It contains an extensive list of geometries, geometric properties and operations – many of which are not appropriate for AIXM. In addition, the ISO 19107 contains a complicated 3D geometry model that is not suitable for AIXM. Instead we propose to use a 2 ½ D model where 3D geometries are represented as 2D projections with additional attributes specifying vertical dimensions. The use of 2 ½ D will require that some ISO 19107 spatial objects be extended to support additional geometric properties.

1.3 References

1. Geographic Information – Spatial Schema. ISO 19107. First Edition, 2003-05-01
2. Geography Markup Language (GML). ISO/TC 211/WG 4/PT 19136 OGC GML RWG. Committee Draft. 2004-02-07.

2 ISO 19107 Profile

2.1 Based on GML 3.2

Since AIXM 5 will ultimately be used for aeronautical information exchange using a GML XML document, it is important that the AIXM 5 Profile for ISO 19107 be compatible with GML. Annex D in the GML 3.2 specification [2] describes the GML profile of ISO 19107.

The AIXM 5 Profile for ISO 19107 is based on the GML Profile of ISO 19107. The remaining sections describe restrictions and extensions to the GML Profile of ISO 19107.

2.2 Supported geometries

AIXM 5 supports the following geometries:

- GM_Point (GML:Point)
- GM_Curve (GML:Curve)
- GM_Polygon (GML:PolygonPatch)
- GM_MultiPoint (GML:MultiPoint)
- GM_MultiCurve (GML:MultiCurve)
- GM_MultiSurface (GML:MultiSurface)

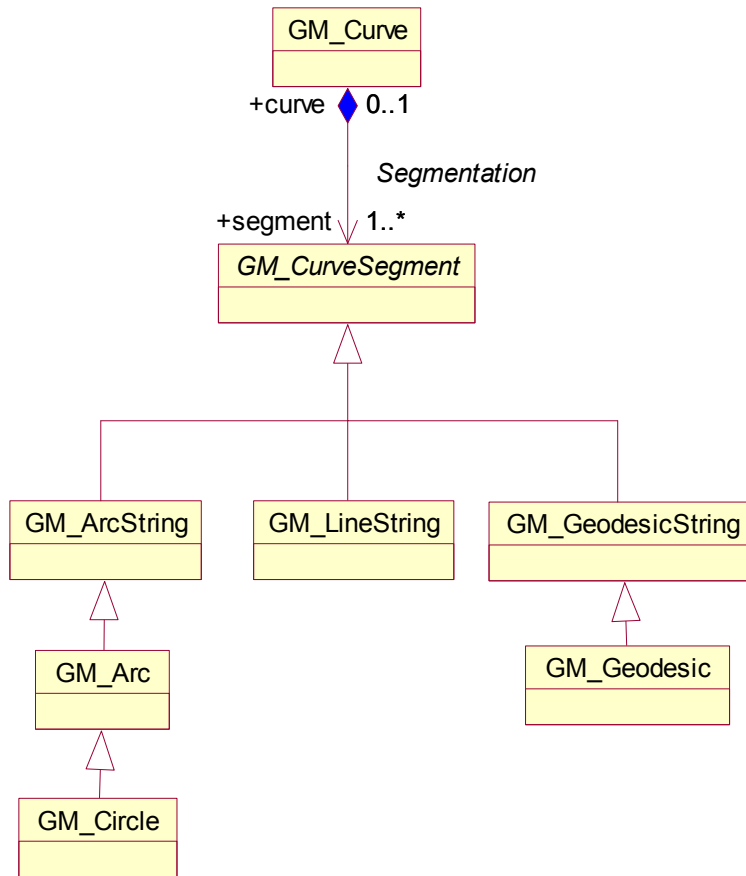
The geometries are subject to the limitations described in the subsections below.

2.2.1 GM_Point Restrictions

AIXM 5 imposes no restrictions on GM_Point.

2.2.2 GM_Curve Restrictions

AIXM 5 Curve segmentation is limited to the following forms:

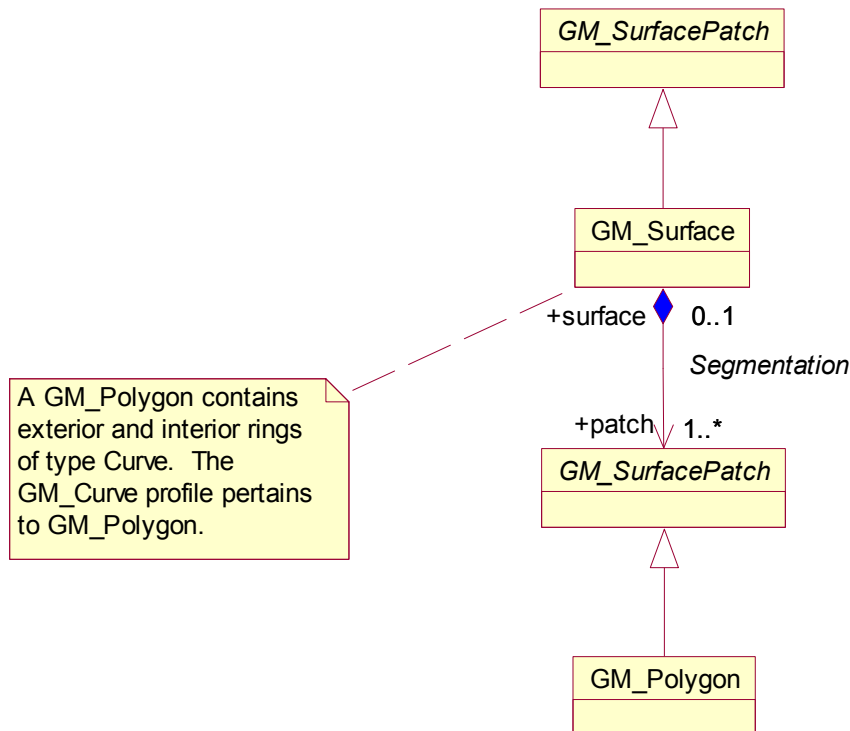


In addition, AIXM 5 supports:

- GML:ArcByCenterPoint
- GML:CircleByCenterPoint

2.2.3 GM_Surface restrictions

AIXM 5 Surfaces are limited to polygon patches. The curve segments used to construct the polygon patches must conform to the restrictions listed in Section 2.2.2.



2.2.4 GM_MultiPoint restrictions

AIXM imposes no restrictions on GM_MultiPoint

2.2.5 GM_MultiCurve restrictions

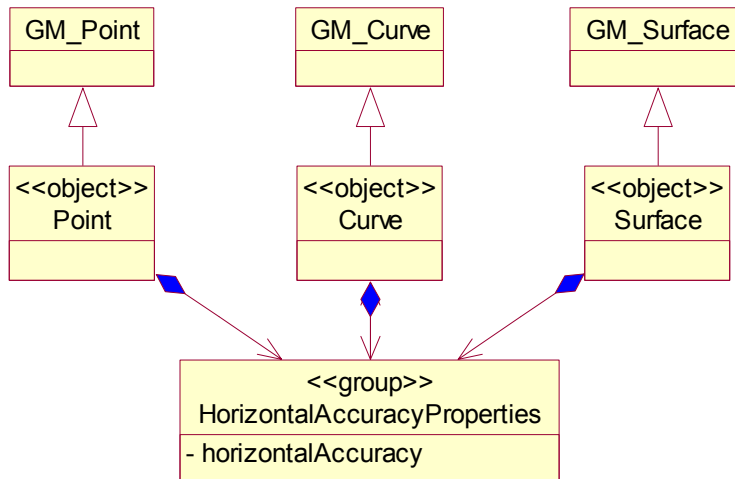
AIXM imposes no restrictions on GM_MultiCurve

2.2.6 GM_MultiSurface restrictions

AIXM imposes no restrictions on GM_MultiSurface.

2.3 Extensions for horizontal accuracy

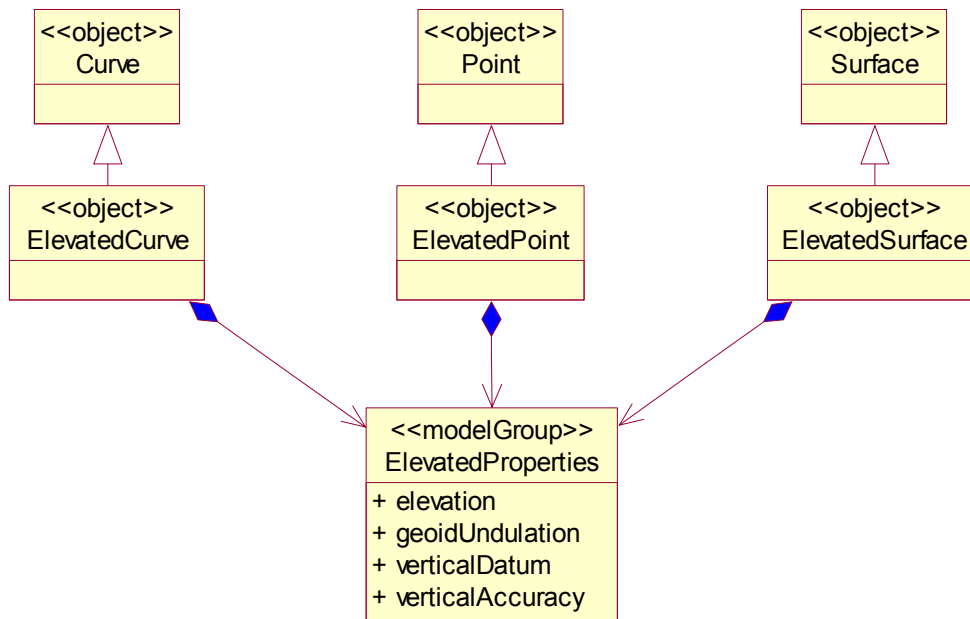
The GM_Point, GM_Curve and GM_Surface geometries are extended to include a horizontal accuracy property. In AIXM 5 horizontal accuracy is considered a property rather than metadata.



Property	Definition	Value Domain
horizontalAccuracy	The horizontal distance from the stated geographical position within which there is a defined confidence of the true position of the aerodrome/heliport reference point falling.	Horizontal Distance with Unit of Measurement (FT, M, NM, KM)

2.4 Extensions for 2 ½ D

The Point, Curve and Polygon classes are further extended to support vertical properties.



Property	Definition	Value Domain
Elevation	The vertical distance to the highest point on the geometry from Mean Sea Level.	Vertical Distance with Unit of Measurement (FT, M)
geoidUndulation	A distance separating the geoid and the ellipsoid at that position. In respect of WGS-84 geodetic datum, the difference between the WGS-84 ellipsoidal height	Vertical Distance with Unit of Measurement (FT, M)

Property	Definition	Value Domain
	and geoidal height represents geoidal undulation.	
verticalDatum	Attribute to take the "Vertical Datum" (this can be a global geoid, such as EGM-96, or a local reference to a the tide gauge used to determine MSL - for example, "AMSTERDAM GAUGE", "NEWLYN" etc.).	Text value indicating the vertical datum
verticalAccuracy	The vertical distance from the stated elevation within which there is a defined confidence of the true position falling	Vertical Distance with Unit of Measurement (FT, M)